relics of the Royal Navy deposited through the Lords of the Admiralty in the Royal Naval Museum at Greenwich.

The Windward, having been repaired and improved, sailed from Sydney, C.B., July 21, 1900, under Captain Samuel W. Bartlett, with Mrs. Peary and Ahnighito Peary on board, with instructions to proceed to Etah, and failing to find there Commander Peary, to cross Smith Sound to Cape Sabine, and push northward as far as might be necessary to open communication with him. The club chartered in 1901 the steamer Erik, Captain John W. Blakeney, and dispatched her from Sydney, C. B., on July 18, with instructions to proceed to Etah, where, on August 5, junction was effected with Commander Peary and the Windward, which had been ice-bound in Payer Harbor during the entire winter. The Erik and Windward spent August in the north waters, the former arriving at Sydney September 15, and the latter at Brigus, N. F., September 24. The Erik brought Commander Peary's report of his delineation of the northern end of Greenland in 1900, and Lockwood's original record from his cairn of 1882, at his farthest.

The club installed new boilers and engines in the Windward at Newburgh, N.Y., in 1902, and on July 20 of that year she sailed a third time for the North, effecting junction with Commander Peary August 5 at Cape Sabine, and returning with him to Sydney, C. B., September 15. He brought also from Fort Conger the library, instruments, and all the remaining equipment of the Lady Franklin Bay Expedition.

The founders of the club were: Morris K. Jesup, Henry W. Cannon, James J. Hill, John M. Flagler, Frederick E. Hyde, E. C. Benedict, H. Hayden Sands, A. A. Raven, Henry Parish, Eben B. Thomas, James M. Constable, Herbert L. Bridgman, Henry H. Benedict and Eliphalet W. Bliss.

Full contributing members, Edward G. Wyckoff and Clarence W. Wyckoff, of Ithaca, N. Y., and Grant B. Schley, of New York, were in 1898 elected to membership in the club, and President Charles P. Daly, of the American Geographical Society, to its executive committee, in recognition of the contribution by the Society.

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## GEOGRAPHICAL RECORD.

### AMERICA.

CHANNELS FORMED ALONG ICE MARGIN IN CENTRAL NEW YORK.—In the 20th Annual Report of the New York State Geologist, Fairchild described some channels which he attributed to the work of streams flowing along the margin of the great ice-sheet when it was melting away from the northern central part of New York. By later work he has gathered facts leading him to the conclusion that there are other and lower channels farther north, between Syracuse and Rome. His results are presented in a brief article (21st Report N. Y. State Geologist, 1901, pp. 233–247), illustrated by four maps and 21 full-page half tones. These channel-ways, in some of which only one bank is preserved (the other having been

ice), while in others there are two banks, extend from Syracuse to Rome approximately along the line of the New York Central Railway and Erie Canal, both of which, in fact, sometimes follow the grade of the old glacial stream beds.

One of these marginal rivers is believed to have formed the valley which enters the City of Syracuse from the west, past Burnet Park, and leaves the city on the east along the line followed by the canal and the railways, being traceable as far as East Syracuse. "The business section of Syracuse and all the south part of the city occupy the detrital plain or delta which accumulated in the Onondaga embayment by the great river which cut the Burnet Park channel, and partly through more recent work of the Onondaga Creek."

These preliminary notes are of distinct interest, but glacial geologists await with especial interest the publication of the final paper, with full discussion of the phenomena, which Fairchild promises. R. S. T.

Detailed Pleistocene Mapping in New England.—In mapping the Pleistocene geology of the Housatonic Folio in western Massachusetts, Mr. F. B. Taylor has experienced no little difficulty in accounting for the phenomena which he has met in the field. His paper on The Correlation and Reconstruction of Recessional Ice Borders in Berkshire County, Massachusetts (Journal of Geology, Vol. XI, No. 4, 1903, pp. 323–364), published in advance of the appearance of the folio, is his forewarning of the introduction into Pleistocene work of an element hitherto unused—interpolation.

The region comprises the southern two-thirds of Berkshire County and includes portions of Connecticut and New York. The rocks are crystalline, there has been little glacial erosion, and an exceedingly rugged topography has greatly complicated ice movement. A main north-south valley with a north-flowing and a south-flowing stream, a broad lateral valley at right angles to it, two main mountain masses, rising well above 2,000 feet, and deep valleys trenching the main plateau characterize the region.

Taylor finds that the eastern limb of the Hudson valley lobe of the continental glacier covered this region with thick ice, which retreated across it from southeast to northwest, building recessional moraines, fifteen in number, about every 3½ miles. The valleys contain the best moraines, in the form of terminal deposits; but he also finds lateral moraines, stoss moraines, marginal drainage

channels, kames, eskers, moraine-headed gravel trains, and deltas associated with marginal lakes. Between these deposits there are, however, extensive areas of hillside and hilltop on which no evidence of terminal deposits was found. The purpose of his paper is to state his method of restoring the position of the ice margin in these intervals.

That interpolation will be necessary in detailed Pleistocene mapping is certain, and to Taylor belongs the credit of making the first attempt. The value of one's results in this direction will, of course, depend upon the correctness of the principles upon which the interpolation is based. Among the important basal principles which Taylor proposes for this region are the following: The main ice retreat was from southeast to northwest; the ice tongues of the various valleys moved synchronously, therefore admitting of no overlapping of morainic deposits; the slope along the margin of the ice tongues was uniformly about 100 feet per mile.

From merely reading the summary statements of the paper the reviewer is not fully convinced of the unquestionableness of some of these premises, on which the proposed reconstruction stands or falls; for instance, the matter of contemporaneous movements for all valley tongues and its vitally important elimination of possible overlappings. The question arises also as to whether there was such a uniform rate of slope as is assumed; whether, for example, full allowance is made for the effect of difference in width of valley, slope of valley floor, direction of the valley relatively to the main ice movement, and nearness to actively-moving ice. That there was not local glaciation of the Greylock mass—rising 3,500 feet—and of Mt. Everett, which is 2,600 feet in elevation, influencing ice-tongue movement, is a point that Mr. Taylor may have determined, but which, if not eliminated, must surely be considered. These questions are raised in no spirit of captious criticism, but with full recognition of the difficulties which confronted the author and sympathy with his efforts to establish a working basis for successful interpolation.

Interpolation will be used only as a last resort, and doubtless Taylor has exhausted all the possibilities of actually tracing ice-front deposits from valley to valley, and has thus been forced to attempt a reconstruction from fragmentary data. That there should not be ice-front deposits on some of the hills seems remarkable. In the hilly, dissected plateau of southern central New York, ice-margin deposits are traceable over hills 1,800 feet high, though sometimes with great difficulty. The more rugged topo-

graphy and harder rock of the Berkshires may account for the absence of similar records of ice-fronts there.

R. S. T.

GLACIAL GEOLOGY IN THE UNITED STATES GEOLOGICAL SURVEY GEOLOGIC FOLIOS.—The earlier folios of the Geological Survey dealt largely with areas presenting economic problems; now the work is being extended to other regions, and ultimately the entire country will be covered. About 100 folios have so far appeared.

In some of the more recent folios the study of the glacial deposits is being made one of the special features, and maps are prepared to show their nature and distribution. Several folios that have already appeared contain such maps, and others are being prepared. Among those so far published are the Holyoke, Mass.; Danville, Ill.; Ditney, Ind.; Elkland, Tioga, Pa.; Gaines, Pa.-N.Y., New York City, and Chicago folios.

The undertaking of this work marks an important event in American glacial geology, for it inaugurates new methods in the study of the glacial deposits. While some of the main facts of glacial geology have been discovered, and many working hypotheses proposed, the time has come when, in order to make much further progress, work of intimate detail must needs be done in many areas. The preparation of these folios will provide the opportunity for such study; and with the facts thus gathered rival hypotheses may be tested and unexplained phenomena accounted for. The present condition of glacial geology indicates that this gathering of facts is now its greatest need.

R. S. T.

YOSEMITE VALLEY.—Although many have studied the Yosemite region, there is still a difference of opinion concerning the cause of the remarkable valley and the falls. One hypothesis is that the deep main valley was cut out by stream erosion before the glacial period; another that it is due to ice erosion; a third that there has been a downfaulting of the valley bottom. By either explanation the tributary valleys from which the waterfalls are supplied are supposed to have been left hanging above the bottom of the main, over-deepened valley.

Prof. Branner (Journ. Geol. XI, 1903, p. 547) accepts the river erosion theory of Turner, according to which the influence of rock and joint planes has had much to do in determining the peculiar topography of the valley. He also draws attention to an interesting phenomenon—namely, the presence of a gorge at one side of the

hanging tributary valleys and deeper than the gorge through which the waters now pass. This is true not only in the Yosemite Fall but also in the Illilouette and Nevada Falls. Branner accounts for this by the erosive action of a glacial stream flowing along the ice margin when the side valleys were filled with valley glaciers. When the ice tongues disappeared these short gorges were abandoned because, although they formed notches in the valley edge, they did not lead back to the axes of the side valleys. Seen from below one wonders why the water of the falls does not emerge from these lower notches; but from above it is seen that there is no connection between the notches and the valley axes.

R. S. T.

EXPEDITION TO THE BAHAMA ISLANDS. — The Geographical Society of Baltimore, which was organized in October, 1902, fitted out a two-masted sailing vessel last spring for scientific work in the region of the Bahama Islands. The expedition, which was directed by Dr. George B. Shattuck of Johns Hopkins University, left Baltimore on June 1, 1903. The scientific staff numbered 22, the chiefs being Dr. Shattuck of the geological staff; Dr. W. C. Coker of the University of North Carolina, botany; Mr. Barton A. Bean, curator of fishes in the United States National Museum, marine zoology; Mr. J. H. Riley, curator in the National Museum, land zoology; Dr. Oliver L. Fassig, United States Weather Bureau, climatology and physics; and Mr. C. N. Mooney, Department of Agriculture, soil survey.

A report of the work of the expedition, written by Dr. Shattuck, appeared in *Science* (No. 457, pp. 427–32). The survey ascertained that the matter composing the Bahama Islands is not entirely made up of wind-blown coral and lime sand, but that the lower part of many islands, extending from 10 to 25 feet above the present mean tide, was deposited by the ocean, and contains marine organisms in large numbers. On this lies the deposit of wind-blown material. Both elevations and depressions have occurred; a beach mark and tide gauge were set up at Nassau to settle the question whether either process is now going on.

In the botanical department about 500 plants were collected for future study, including the lower forms of plant life, such as seaweed, fresh and salt water algæ, fungi, and lichens. The principal work was the study of plants in relation to environment.

About 1,000 specimens of marine life, 260 skins of representative birds, 100 of reptiles, and 300 of mammals were collected for

the National Museum, and interesting results were accomplished in other departments. The medical survey showed the prevalence of leprosy, the better physical types presented by the pure blacks or whites in contrast with those of mixed blood, and the better health in islands depending for food chiefly upon farm products, as compared with those in which marine food is the chief reliance.

HOVEY ON WEST INDIAN VOLCANOES.—The dramatic events associated with the eruption of Mont Pelé and La Soufrière, a year and a half ago, together with the accessibilty of the region, have led to such a thorough study of the eruptions and their effects that these volcanoes promise to serve as standard examples of volcanic eruptions, possibly replacing in part the time-honoured Vesuvius. One of the most active workers in this field has been Dr. E. O. Hovey, who has given to us not only many new facts of his own observation but summaries of the results obtained by other workers.

Just when the interest of people was beginning to flag, because of the over-supply of articles on these volcanoes, Pelé caused a revival of interest by the development of a new feature in the form of a spine or tooth which at one time reached a height of more than 1,000 feet. This spine, which rose from one side of the crater, has suffered many changes since it first appeared, and in a recent article (Amer. Journ. Sci., XVI, Oct., 1903, pp. 269–281) Hovey describes these changes, also presenting a number of excellent illustrations. He explains the phenomenon as follows:

> The spine or tooth consists of solid rock, which seems to have been pushed up bodily into its present position, and to be maintained there, somewhat like the stopper in a bottle, by friction against the sides of the neck and by the expansive forces underneath. The shape of the spine, with its sides forming angles of 75°, 87°, and even 90° with the horizontal, is a strong argument against the theory that it has been formed by ejected blocks or bombs which were sufficiently pasty to stick together on falling, and in favour of the "stopper theory." Furthermore, the northeast side of the spine presents a fairly smooth, vertically-grooved surface, as if it had been slicken-sided by friction against the side of the conduit during its ascent (see figs. 5, 6, and 7, Pl. XII, XIII). The great and sudden changes in the altitude of the spine with reference to the rest of the cone point in the same direction.

In a short article in *Science* (Vol. XVIII, Nov. 13, 1903, pp. 633–634) Hovey extends the history of the spine from May to October. In this, after describing numerous variations in the spine, he states that this phenomenon, which "was such a wonderful part of the mountain from November, 1902, to June, 1903, had practically disappeared early in August," 1903.

The same author has published in the American Museum Journal (Vol. III, 1903, pp. 41–54) a preliminary note on his observations during a recent visit to the volcanic islands of the Antillian chain. In this he briefly describes the condition of the volcanoes and presents some interesting photographs. The cone of Pelé has increased in height from 4,428 to 5,150 feet, and the valley of the Rivière Blanche has been decidedly filled with ash. Denudation has also been vigorously at work on the loose ash both in Martinique and St. Vincent. Hovey states, for example, that in a few months not less than 150,000,000 cubic feet of material have been removed from the gorge of the Wallibou in St. Vincent. The publication of his final report will be awaited with interest.

R. S. T.

Secondary Phenomena of the West Indian Volcanic Eruptions in 1902.—Mr. George C. Curtis describes (Journal of Geology, Vol. XI, 1903) some interesting phenomena connected with the eruptions in Martinique and St. Vincent. The mud-flows, which are an important phenomenon in connection with these eruptions, he believes to have been caused by the discharge of the waters of crater lakes over the mountain sides. The hot volcanic ash in the stream beds gave rise to phenomena of secondary eruptions, which he calls geyser-like eruptions, in which steam rose in some cases to a height of over 3,000 feet. It was such eruptions that gave rise to the early theory that St. Pierre was destroyed from a secondary crater in the valley on the mountain side. These secondary eruptions are due to the influx of water to the hot ash beds, which transformed it to steam, causing explosions; and Curtis suggests several reasons why there may be sufficient concentration of steam to cause such explosions. The geyser-like eruptions formed ash cones with craters closely resembling those of volcanoes, and the material of which they are made is in some cases fragments, the size of a man's head. In valleys down which the mud-flows passed, the surface often has a hummocky topography, resembling in form that of sand dunes, to which Curtis gives the name ash cone topography. This he believes to have been caused by numerous explosions, varying in violence, and more or less modified by shifting of vents, migration of stream channels, and other causes.

R. S. T.

Harbour Works at Rio de Janeiro.—The Brazilian Government has signed a contract with a British firm to make improvements in the harbour of Rio to be completed in 1910. Though

the bay is 68 square miles larger than the lower and upper bays of New York together, the water near the shores is shallow, the bottom is silting up, and no large vessels are able to tie up along shore. A sea wall or quay, two miles in length, is to be built along the entire northern front of the city. The quay will be wide enough for railroad trains and wagons to move along it. Outside of the quay a channel will be dredged to a width of 820 feet and a depth of from 26 to 33 feet, so that the largest shipping can be accommodated. Vessels will tie up along the front of the sea wall and cars and wagons will carry freight to or from them.

CLIMATE OF THE ARGENTINE REPUBLIC, Compiled from Observations made to the End of the Year 1900. By Walter G. Davis, Director of the Argentine Meteorological Office. Fol. Buenos Aires, 1902, pp. 154. Pls. XXVI. Text in Spanish and English.

In the Second Census of the Argentine Republic (May 10, 1895), published in 1898, there was a chapter on Climate, written by Mr. Walter G. Davis, Director of the Argentine Meteorological Office. This chapter was in Spanish. It has now been reprinted, in Spanish and English, with the addition of newer data to the end of 1900, and of a larger number of stations. Altogether, the volume is one of the best publications on the climate of one country which we have seen, and bears witness to the excellent work which Mr. Davis is doing in his adopted land. The Argentine Meteorological Service now stands with most of the services of the North Temperate Zone, and is a splendid monument to the skill, the energy, and the scientific ability of its directors.

The treatment of all the climatic elements is thoroughly scientific and complete. In fact, the volume might well serve as a model for future investigations of this sort. The Republic may be divided into three general climatic provinces, on the basis of the temperature and rainfall, the Littoral, the Mediterranean and the Andine, the axes of greatest elongation being north and south, and each of these three main divisions being subdivisible into northern, central, and southern sections, whose differences depend chiefly on latitude and altitude. With the great extent of the Argentine, embracing as it does 33° of latitude, the differences between north and south are necessarily very great; but there are also extraordinary changes in temperature and rainfall in going from east to west across country, narrow as it is. Thus, taking the zone of a degree and a half of latitude which lies north of the Tropic of Capricorn,

we find, on the eastern frontier, a mean annual temperature of 73.4°. Crossing the isotherms at right angles, a temperature of less than 57.2° is found at the western limits. As to rainfall, in this same distance of about 500 miles "the aspect of the country changes from the lowlands of the Chaco, covered with a tropical vegetation, to the arid table-lands of Salta and Jujuy, which in turn merge into the Cordilleras, with their highest peaks under the mantle of perpetual snow."

The famous Argentine "zonda" is described as being so dry that people sprinkle their floors and walls to cool the air while it blows. A section is devoted to the temperature of evaporation, which has been called "sensible temperature," and we have never seen a publication which contained tables and charts of sensible temperatures, by months, for a number of stations. Perhaps the most striking feature on any of the charts in the volume is the rapid decrease of pressure south of the 45th parallel, shown on the isobaric maps, the successive isobars running across the country, almost due east and west, close together. This is the natural consequence of the southward extension of South America into the region of permanent low pressure in the Antarctic. The highest relative humidity is found in the north and in the extreme south. In the Andine provinces it frequently happens that the relative humidity does not exceed 2 or 3%. In fact, according to the ordinary psychrometer tables, some observations in this district give a relative humidity of 0%. As this is impossible, it is clear that the reduction formulæ are not applicable to such cases of extreme dryness.

In places near the foothills and eastern slopes in the Andine region rain is almost unknown, while in the extreme northeast the isohyetal line indicates a rainfall of over 80 inches.

Nothing but praise can be given to this admirable volume, which is so complete, so well written, and so abundantly illustrated. Now that attention is being turned more and more to South America, it is well to have such a report at hand for reference. Would that we had something of the sort for the United States!

R. DeC. W.

## ASIA.

PHILIPPINE COAST SURVEY.—Mr. George R. Putnam, in charge of the Philippine coast surveys since they were started in January, 1901, informs the *National Geographic Magazine* (Dec., 1903) that during the past year the survey steamer *Pathfinder* has completed

the survey of San Bernardino Strait and Albay Gulf, of San Pedro Bay, and the southern coast of Samar, and has also made a thorough examination of the much-frequented passage southwest of Leyte, where a danger to navigation had been reported. Among the latest harbour surveys are those at Cebu, Ormoc, and Romblon. The small wooden steamer *Research* has made a number of harbour surveys on the west and southeast coasts of Luzon and on Mindanao and Culion Islands, and is now working on the coast of Negros. Chartered launches are also employed in the quieter waters of the deep indentations, and by this means a survey of Lingayen Gulf has recently been completed.

Charts embodying the results of the surveys are prepared in the office at Manila, published by lithography and distributed. Seven pamphlets of sailing directions have been issued, and "Notices to Mariners" are printed from time to time, giving new information of immediate importance, such as dangers discovered, aids to navigation, and changes in the charts.

Many parts of the coasts have as yet been only roughly sketched, while other surveys are controlled by triangulation. There are nearly 1,700 islands in the Philippines that are named, and it is possible to count 3,000 islands and islets on the charts.

MONTHLY NORMALS OF AIR PRESSURE IN INDIA.—Barometric observations in India were originally taken to aid in working out the climatology of that region, and they were not published in the form of daily weather reports. The importance of early information regarding coming weather conditions, and especially regarding rainfall, with the added emphasis which was given to this matter by the occurrence of the Bihar Famine in 1874, the Madras Famine in 1877, and the late and scanty rainfall of the southwest monsoon in 1878, over Northwestern India, led the Government of India to sanction arrangements for the publication of a daily weather report in June, 1878. At first this report included the observations recorded at 10 A. M. at about 100 stations, and a brief summary of the observations, and it was issued without an illustrative chart. The hour of observation was later changed to 8 A. M., the observations being for a time recorded at 8, 10, and 16 hours. The mean monthly pressures for the 10 and 16 hours for the years previous to 1889, and, after that, the mean 8 A. M. monthly pressures, reduced to 32° F. and to constant gravity (Lat. 45°), for all observatories in India which have been in operation at least twenty years, have now been published by Sir John Eliot, Meteorological Reporter to the

Government of India (Vol. XIV, Part II, Indian Meteorological Memoirs), the volume furnishing the most complete information in regard to the pressure conditions of India. It is a noteworthy fact that there are some persistent disagreements between the pressures at some of the stations, the four most marked cases being those of the observatories at Dehra Dun, Ajmer, Jaipur, and Salem. At each of these four stations the 8 A. M. pressures are somewhat too high. The explanation given by Sir John Eliot is that these observatories are more or less completely shut in by hills of considerable elevation, which diminish the horizontal air movement, and thus give a somewhat higher air pressure during the morning than there would be in the case of free air movement. The effect is purely topographic. In the cases of Ajmer, Salem, and Dehra Dun, which are almost completely shut in, the excess of pressure averages about .02 ins. At Jaipur, which is less completely surrounded, it is about .010 ins.

R. DE C. W.

THE GERMAN RAILROAD IN SHANTUNG.—This railroad, from the port of Tsing-tao on Kiao-chau bay across Shantung province, China, to the large city of Tsinan-fu, on the Hoang River, will be completed before June 1 next. Four-fifths of the line is now in operation. On September 1 last the road was completed to Chou-tsun, 196 miles from its starting-point. This city of about 50,000 inhabitants has a great trade, and is the emporium of the silk trade of Shantung. The city of Tsinan-fu, to which trains will be running next summer, is the capital of Shantung, and has over 300,000 inhabitants. The commercial routes centering at this great mart extend in all directions and as far away as Peking, Hankow, and Shanghai. The railroad passes through the heart of Shantung, which, according to the Chinese census, taken last year, is the most densely-peopled part of the empire.

## GENERAL.

BRITISH RAINFALL ORGANIZATION.—The retirement, on August 31st last, of Mr. H. Sowerby Wallis from partial charge of the British Rainfall Organization, and the succession of Dr. Hugh Robert Mill to the sole responsibility, makes this time a suitable one for a brief historical note concerning this interesting meteorological service, which was the crowning achievement of the life of the late Mr. George J. Symons. In the year 1859, when Mr. Symons was twenty years old, he began collecting records of rainfall,

and although this did not form a part of his official work for the Meteorological Office, which he joined in 1860, he sent out, late in that year, a circular letter to all the observers of whom he knew in England, stating that he proposed to collect all the published and unpublished observations of rainfall. Mr. Symons's publication was begun in 1860, when "English Rainfall" appeared, containing the observations made at 168 stations. In the following year the publication contained data for both 1860 and 1861, and was entitled "British Rainfall," as it has remained ever since, the number of stations being 360 in England, 11 in Wales, 115 in Scotland, and 21 in Ireland—a total of 507.

In 1863, Mr. Symons left the Meteorological Office to devote himself exclusively to his chosen task, the expense of collecting and publishing being borne by himself alone at the start, but later being shared, in increasing proportion, by the observers and by Mr. Symons's own friends. In ten years the number of stations was 1,500, and the work required all of Mr. Symons's time for nearly five months of each year. The scope of the work had become national in every sense, but Mr. Symons preferred to continue it as a private enterprise, without State aid, feeling that unless this assistance were given without hampering conditions he could carry on his investigations better by himself.

In 1872, Mr. H. Sowerby Wallis became associated in the work, and continued his connection with the organization until his resignation on August 31 last.

In 1890, the number of stations included in the annual volume was 3,000, and the name of Mr. Wallis appeared with that of Mr. Symons on the title-page of "British Rainfall." In March, 1900, after the sudden death of Mr. Symons, Mr. Wallis assumed the entire charge of the work, and this responsibility, together with the vast amount of detail occasioned by the settlement of the estate and the transfer of the Symons Library to the Royal Meteorological Society, and the ill-health from which he suffered, made it necessary for him to give up his arduous labours. Dr. Hugh Robert Mill, whose name is well known to geographers, and who has been associated with Mr. Wallis for the past three years, has now succeeded him as head of the British Rainfall Organization. Dr. Mill has acquired the historic "rainfall house" of Mr. Symons at 62 Camden Square, London, N. W., and all the rainfall records and instruments there. The organization of which Dr. Mill has control is absolutely unique in its character of a national meteorological service conducted as a private enterprise, without Government aid.

This Organization has already done a most important work for British Meteorology and Climatology. That in the future, under its new head, it will continue and extend its useful labours no one who knows Dr. Mill's capacity can doubt.

R. DEC. W.

VARIATIONS OF GLACIERS.—Each year the International Committee on Glaciers, appointed by the International Geological Congress, makes a report upon the recorded variations in glaciers throughout the world. The summary of the 6th annual report, written by Dr. H. F. Reid, has appeared in the Journal of Geology (Vol. XI, 1903, 285–288). One of the most striking features of these reports is the fact that, in general, glaciers are retreating at their margins. Of ninety-four Swiss glaciers, only one, the Boveyre in the Valais, was found to be advancing in 1901. This glacier, which has advanced 108 metres in ten years, is doing so because of an avalanche which has increased its thickness and length. The greater number of the fifty-five glaciers in the eastern Alps are also retreating, though a few, especially the Vernagt, are advancing; this glacier having gained 50 metres since 1900. All glaciers observed in the Italian Alps are retreating, and retreat is noticed also in the French Alps, Scandinavian mountains, and the Caucasus. Retreat is indicated in the Alaskan glaciers, and some interesting facts concerning these glaciers are stated. Observations indicate a general retreat of glaciers in the Rocky and Sierra Nevada Mountains.

The facts thus gathered and tabulated have not been recorded long enough to admit of general conclusions; but it is evident that this work is a very important one, and that in time the records will give material of great value in considering the nature and causes of fluctuations of glaciers throughout the world. The committee or any one of its members (for example, Dr. H. F. Reid, Johns Hopkins University, Baltimore, Md.) will be very glad indeed to receive any information concerning the changes in glaciers in any part of the world.

R. S. T.

BLOOD COUNTS AT HIGH ALTITUDES.—One of the effects of the decreased pressure which is met with at increasing altitudes above sea-level is a change in the composition of the blood, both of human beings and of animals, as has been observed by several investigators. Viault, for example, examined the blood of men and of animals on the Pic du Midi and on the plateaus of Peru, at altitudes of 12,000–14,500 ft., and found a greater amount of haemo-

globin than usual. Viault's own blood contained 5,000,000 red blood corpuscles per cubic millimeter while he was at Lima, and after two weeks at Maracocha, at an altitude of 14,400 ft., the number rose to 7,000,000, and a week later to 8,000,000. The blood of Viault's companions showed similar changes, while in the case of animals taken from the lowlands to the plateau the increase was in the ratio of 4.8 to 7.0. Müntz found about the same ratio in the case of rabbits taken onto the Pic du Midi. On descending to the lowlands, this increased amount of haemoglobin in the blood is lost. Similar investigations have been made by Bert, Egli-Sinclair, Egger, and others, the general feeling being that the increased number of red corpuscles is needed to enable the blood to absorb sufficient oxygen from the rarefied air.

A recent study of blood counts at high altitudes has been made in this country by John Weinzirl, M.S., and C. E. Magnusson, Ph.D., and the results have been published in Nos. 7 and 8 of the *Bulletin of the Hadley Climatological Laboratory* of the University of New Mexico. A grant from the Elizabeth Thompson Fund aided the research. The first paper deals with "Cold as a Causal Factor in the Blood Changes due to High Altitudes," and the second with "Further Observations on Increased Blood Counts due to High Altitudes." The authors of these papers have made numbers of blood counts in the cases of human beings and of rabbits taken to high altitudes, and they conclude that cold is an important factor, though not the only one, in producing the observed changes in the blood. The increase in the number of red corpuscles they find, as others have already found, to be temporary, and this they believe is also due to the change in temperature and not to the change in pressure. R. DEC. W.

CONCRETIONS AS ELEMENTS IN DETERMINING LAND FORMS.—Among the geological phenomena that have attracted widespread attention from time long antedating the beginnings of geology as a science is the concretion.

The weird and fantastic forms which concretions at times assume early led to attempts at their explanation. Recently Todd (Bull. Geol. Soc. Amer. XIV, 1903, pp. 353–368) has discussed their origin and stated many facts concerning them, presenting also several plates of illustrations. One of the important parts of his paper is that in which he shows that concretions, where abundant, are of importance in influencing the rate of denudation, and, therefore, in determining the form of the land surface. Being more

finely cemented than the rock in which they have developed, they are more resistant to denudation. Therefore they serve to protect the rock in which they are enclosed. Certain pinnacles in Bad Land regions, and certain buttes and knobs, are thus explained as the result of the protection of one part by the presence of concretions, while denudation has removed less protected rock round about. It would be interesting to apply Todd's suggestions to a given region of abundant concretions in order to determine the measure of importance of this element of influence in land sculpture. R. S. T.

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## HUMAN BONES FOUND NEAR GALVESTON.

A Letter Communicated by Mr. James Douglas.

October 12th, 1903.

Dr. James Douglas, President,
El Paso & Southwestern R.R. Co.,
99 John St., New York City, N. Y.

Dear Sir:—

Complying with your request to furnish you the data relative to the human bones found in the ballast pits of the Galveston, La Porte & Houston Ry. (now part of Southern Pacific) near Galveston, Texas, I beg to say:

The ballast pits are situated at the mouth of Clear Creek about 32 miles southeast of Houston, Texas, and 25 miles from Galveston, and lie between the creek and the Bay. Originally they covered about 20 acres, and rose to an elevation of 18 or 20 feet above mean low tide. The deposit consisted of about 50% shell of various kinds, oyster, clam, etc., 40% gravel and 10% coarse sand. The whole deposit was covered with about eight inches of soil, and had a dense growth of live-oak trees, some of which seemed very old. The deposit was in seven distinct strata, averaging about 2½ ft. in thickness, with about two inches of black earth between.

All the strata were very much the same, except the bottom one and the second one from the top. These two had very little gravel in them, and consisted of oyster shells (larger than in the other strata) and black earth, and it was in these two "veins" that we found the human bones, one "layer" of bones a little over three feet below the surface, and the other at sea level about twenty feet below surface.

We found very few bones in the upper stratum—probably ten per cent. of the whole—the greater majority being at about the present sea level.

No accurate count of the total number found was kept, but over fifteen hundred were actually tallied, and a conservative estimate would be five thousand.

At first the gravel was loaded by hand, and during this period the foreman counted the skulls, but, later on, a steam shovel was put to work, and after that no count was attempted, though the bones were uncovered daily until the entire pit was worked out.